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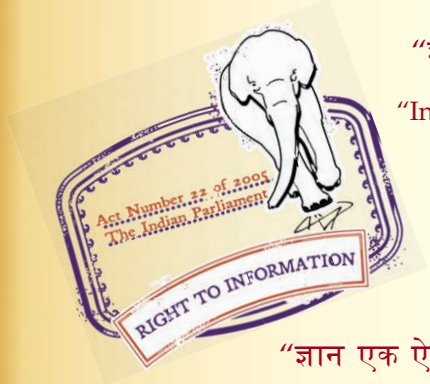

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Indian Standard

(Reaffirmed 2005)

METHOD FOR ASSESSMENT OF POST-HARVEST GRAIN LOSSES BY RODENTS

PART 2 LOSS DETERMINATION BY POPULATION ASSESSMENT AND ESTIMATION PROCEDURES

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METHOD FOR ASSESSMENT OF POST-HARVEST GRAIN LOSSES BY RODENTS

PART 2 LOSS DETERMINATION BY POPULATION ASSESSMENT AND ESTIMATION PROCEDURES

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Indian Standard

METHOD FOR ASSESSMENT OF POST-HARVEST GRAIN LOSSES BY RODENTS

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0. FOREWORD

0.1 This Indian Standard (Part 2) was adopted by the Indian Standards Institution on 28 February 1985, after the draft finalized by the Storage Structures and Storage Management Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Foodgrain losses due to rodents are very high, sometimes ranging as high as 25 to 30 percent. A number of studies and investigations have been carried out to assess these damages. Most efforts at rodent damage assessment have been focussed on crops under field conditions. However, each component namely cropping, handling, transportation, local storage and bulk storage is important in assesseing these losses.

0.3 Although a methodology for assessing post harvest grain losses will not in itself reduce these losses, the methodology is essential to post harvest operational programmes so that priorities for loss reduction can be determined. In addition to serving as a much, needed assessment tool, the methodology and other activities proposed can serve as a means to persuade all concerned that change is necessary and that effective techniques to control losses may be utilized.

0.4 This standard is being dealt with in the following two parts:

Part 1 General considerations, direct measurement techniques and biological aspects of survey procedures; and

Part 2 Loss determination by population assessment and estimation procedures.

0.5 In the preparation of this standard considerable assistance has been taken from the following publication:

HARRIS (Kenton L.) and LINDBLAD (Carl J.). Post Harvest Grain Losses Assesment Methods.

1. SCOPE

1.1 This standard (Part 2) prescribes methods for assessment of losses due to rodents primarily for use in grain stores.

1.1.1 The aim of the methods is to estimate the weight of the grain consumed by rodents. The other related losses attributable, for example, to contamination, health hazards and damage to sacks must be evaluated by other means.

2. PERSONNEL AND TRAINING

2.1 The work, including all practical operations such as placement, setting and checking of traps should be performed by technology graduates, preferably with some experience in the field of rodent control, grain storage or small mammal ecology.

3. SELECTION OF STUDY SITES AND PRELIMINARY SURVEY OF INFESTATION

3.0 A preliminary survey of the study site must always be made as given in method A (*see* **3.1**) along with the detailed techniques, as prescribed under method B (*see* **3.2**) and method C (*see* **3.3**).

3.1 Method A — Preliminary Survey

3.1.0 This survey procedure will lead to valid estimate of the quantity of grain lost to rodents only if it is followed up with either the method B (*see* **3.2**) or method C (*see* **3.3**).

3.1.1 *Equipment*

3.1.1.1 *Electric flash light torch*

3.1.1.2 *Tracking powder, talcum or finely powdered chalk* — A glass jar with a perforated lid provides a convenient means of dispensing the powder.

3.1.1.3 *Clipboard and record sheets*

3.1.2 *Procedure*

3.1.2.1 Two visits will be required. On the first visit record the following information on a record form:

a) Date of survey;

b) Address of store;

c) Commodities stored and quantities (by weight);

d) Nominal capacity of the store;

e) Expected date of outward shipment;

f) Estimated annual turnover (by weight);

g) Brief description of the storage structure and conditions of Storage; and

h) A sketch map of the store showing important features and location of the stored grain.

3.1.2.2 During inspection, record the signs of rodent infestation, including burrows, excreta, smears, foot prints, damage to the commodity or structure, etc, on the sketch map as they are found. Whether or not signs of infestation are found, lay tracking patches approximately 200 × 300 mm at intervals along the walls of the store and beside the stacked grain, especially around corners. The tracking patches should be laid at the rate of approximately one per 50 tons of grains, except that in stores of less than 250 tons, not less than 5 patches should be laid.

3.1.2.3 The second visit should be made the next day and the presence or absence of rodent tracks on each tracking patch recorded.

3.1.2.4 A simple estimate of the incidence of infestation may be calculated when random sample of stores of a single type has been surveyed, as follows:

$$\text{Percent of stores, infested} = \frac{\text{Number of stores infested}}{\text{Number of stores surveyed}} \times 100$$

$$\text{Percent standard error} = \frac{(\,\%\text{ stores infested} \times \%\text{ stores not infested}\,)}{\text{Number of stores surveyed}}$$

3.2 Method B — Trapping to Extinction

3.2.0 This method is suggested for use in stores with population of up to 200 rodents and would include heavily infested store holding up to 500 tonnes of grains. A complete census of the population is made by trapping all the rodents that have access to the grain and the loss is estimated by multiplying the number of rodents by their daily food requirement.

3.2.1 *Equipment*

3.2.1.1 Snap traps, 200 (rat sizes; striking bar 70-80 mm long).

3.2.1.2 Snap traps, 200 (mouse size, striking bar 40-50 mm long).

3.2.1.3 Spring balance (100 × 1 g).

3.2.1.4 Spring balance (500 × 5 g).

3.2.1.5 Black board chalk for making trap locations.

3.2.1.6 Bait of a sticky consistency such as peanut butter, crushed fruit (banana, oil palm pericarp or melon) or sweetened dough.

3.2.2 *Procedure*

3.2.2.1 First make the preliminary survey (*see* **3.1**). The bulk of the rodent population should be caught in the first week and complete trapping done in a period not exceeding 21 days.

3.2.2.2 Traps should be distributed at intervals of 1 m or less in all places where the presence of rodents is suspected. Place the traps in a systematic sequence (called the 'trap round'), numbering and entering each placement on the record sheet.

3.2.2.3 Each day check the trap round and record the species and body weight of each rodent caught for each trap.

3.2.3 *Grain Loss Assessment*

3.2.3.1 The primary data which should be reported are the numbers and the body weight of each species of the rodent trapped. The data for each species should be divided into two body-weight classes, that is, 50 g or less and more than 50 g. The biomass (sum of the body weights) of each weight class should then be obtained for each species. The estimate of the daily grain loss attributable to each species is obtained by multiplying the biomass of the rodents in each weight class by a factor representing the daily grain requirement of a rodent in that weight class, and then adding together the two products.

3.2.3.2 It will generally be adequate to base the calculation on an assumed grain consumption equivalent to 7 percent of body weight for rodents weighing more than 50 g and 15 percent of body weight for rodents weighings 50 g or less.

3.2.3.3 The estimated daily grain loss attributable to species '*A*', for example, would be:

$$(0{\cdot}07\ a + 0{\cdot}15\ b)\ g$$

where

a = biomass (g) of rodents of species '*A*' weighing more than 50 g, and

b = biomass (g) or rodents of species '*A*' weighing 50 g or less.

3.2.4 The total estimated daily grain loss is then readily determined by adding together the estimates for different species, and should be expressed both as an absolute amount and as percentages of the amount of grain in the store and of nominal capacity of the store. If it can be assumed that the rodent population was reasonably stable, than the loss over a period of time can easily be calculated.

3.3 Method C — The Lincoin-Peterson Method of Population Estimation

3.3.0 This method is based on the capture, mark and release technique. The application of this method requires that duration of the study should be sufficiently short so that no significant changes occur in the population and the chance of capturing a rodent in the second sample is independent of whether or not it is marked. The first assumption may be satisfied by completing the study in a period not exceeding 21 days. The second assumption may be satisfied by using live capture traps for the first sample and snap traps to collect the second sample, since the behavioural responses of rodents to the two types of traps are relatively independent of one another.

3.3.1 *Equipment*

3.3.1.1 Live-capture traps, 100 (rat size).

3.3.1.2 Live capture traps, 100 (mouse size) of sheet metal of 7 mm or finer wire mesh funnel-type multiple catch trap with a horizontal counter-poised dier operated by the weight of the rodent as it approaches the holding compartment, and the single catch trap with a door-closing mechanism operated by a treadle.

3.3.1.3 Restraining device (simple) to hold live rodents for marking.

3.3.1.4 Dissecting scissors, 2 pairs.

3.3.2 *Procedure*

3.3.2.1 After completing preliminary summary (*see* **3.1**), the operation is carried out in two steps as follows:

a) Stage 1 lasts 10 days. In this stage capture, mark and release as many rodents as possible. Distribute, bait and set the live-capture traps, recording the trap round as in Method B. An average density of one-rat size and one mouse-seized trap per 9 m^2 is suggested. Every morning, each newly caught rodent must be marked by clipping off the middle digit of the right hand foot. Newly marked rodents should be released at the point of capture and their numbers and species recorded beside the trap entry on the record sheet.

b) Stage 2 also lasts 10 days during which the objective is to snap-trap as many rodents as possible, using the procedure described under Method B. The body weight, species, and presence or absence of mark should be recorded for each rodent trapped.

3.3.3 *Population Estimates and Grain Loss Assessment*

3.3.3.1 The primary data which should be reported is as follows:

a) The numbers of each species marked in stage 1,

b) The numbers of marked rodents of each species trapped in stage 2,

c) The numbers of unmarked rodents of each species trapped in stage 2, and

d) The species and body weight of each rodent trapped in stages 2.

3.3.3.2 The population estimate (P) for each species is:

$$P = \frac{a\,n}{r}$$

where

a = number marked in stage 1,

n = total number caught in stage 2, and

r = number of marked rodents caught in stage 2.

3.3.3.3 For estimating daily grain consumption it is necessary to determine the weights and relative sizes of the two body-weight classes by reference to the sample of rodents trapped in stage 2. Thus, where in the absence of data from captive rodents it is assumed that the daily grain consumption figures for animals greater than 50 g and for smaller rodents are respectively 7 and 15 percent of body weight, the daily grain loss attributable to species A will be:

$$P\,[\,0{\cdot}07\,ab + 0{\cdot}15\,(\,1 - a\,)\,c\,]\ \text{g}$$

where

P = the population estimate for species A,

a = the proportion of rodents of species A,

b = the mean body weight (g) of rodents of species A weighing more than 50 g, and

c = the mean body weight (g) of the rodents of species A weighing 50 g or less

NOTE — The parameters a, b and c must be calculated from sample trapped in stage 2.